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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,589	10/16/2003	Sang-In Han	001.3000	2253

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EXAMINER

ROSASCO, STEPHEN D

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 07/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/688,589

Applicant(s)

HAN ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Detailed Action

In response to the Amendment of 6/21/05 the examiner withdraws the prior office action rejections and includes a new rejection here over newly cited art.

Remarks – The applicant has argued that the layers of the claimed invention are much thinner than those of the cited art. The examiner has cited new art to respond to this amendment.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-16 and 18-29 are rejected under 35 U.S.C. 102(e) as being anticipated by La Fontaine et al. (6,645,679).

The claimed invention is directed to an extreme ultraviolet (EUV) lithographic mask and a method of forming an extreme ultraviolet (EUV) mask for reflecting radiation having a wavelength less than 40 nanometers comprising the steps of: providing a substrate; forming a first reflectance region overlying said substrate; forming an attenuating phase shifter overlying said first reflectance region wherein said attenuating phase shifter attenuates EUV radiation through a combination of destructive interference and absorption and wherein said attenuating phase shifter is less than 700 angstroms thick; and forming

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a plurality of openings through said attenuating phase shifter to expose said first reflective region.

And wherein said step of forming an attenuating phase shifter overlying said first reflectance region wherein said attenuating phase shifter attenuates EUV radiation through a combination of destructive interference and absorption and wherein said attenuating phase shifter is less than 700 angstroms thick further includes the steps of forming an embedded layer overlying said first reflectance region, said embedded layer being tuned to destructively interfere with EUV radiation; forming a second reflectance region overlying said embedded layer, and forming an absorber layer overlying said second reflectance region wherein said embedded layer acts as an etch stop when forming said plurality of openings.

La Fontaine et al. teach an attenuated phase shift mask for fabrication equipment, the mask comprising: means for reflecting radiation; means for attenuating and phase shifting the radiation, wherein the means for reflecting and means for attenuating and phase shifting are on a same surface and are the same material, wherein at least one of the means for attenuating and phase shifting and the means for reflecting radiation is a depression on the same surface; and a heat mask over the multilayer film, the heat mask including a buffer layer and a metal layer.

And wherein the same surface is a top surface of a multilayer film and the radiation is EUV radiation.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over La Fontaine et al. (6,645,679).

La Fontaine et al. essentially teach the claimed invention including an attenuated phase shift mask for fabrication equipment, the mask comprising means for reflecting radiation, means for attenuating and phase shifting the radiation, wherein the means for reflecting and means for attenuating and phase shifting are on a same surface and are the same material, wherein at least one of the means for attenuating and phase shifting and the means for reflecting radiation is a depression on the same surface, and a heat mask over the multilayer film, the heat mask including a buffer layer and a metal layer.

And wherein the same surface is a top surface of a multilayer film and the radiation is EUV radiation.

The teachings of La Fontaine et al. differ from those of the applicant in that the applicant teaches the use of a 27 Angstroms layer of NiFe in the attenuating phase shifting layer (claim 17). However, it would be expected that any material which had the required optical properties with respect to attenuation and phase shifting could be used in the mask.

Therefore, it would have been obvious to one having ordinary skill in the art to take the teachings of La Fontaine et al. and incorporate the use of an NiFe layer in order to make the claimed invention because one would know to use any material that had the required optical properties with respect to attenuation and phase shifting.

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Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized, sweeping flourish at the end.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
07/12/05